

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(19)



SCIENCE REFERENCE LIBRARY

(54) IMPROVEMENTS IN NOTCHING MACHINES

- (71) We, L. SCHULER G.m.b.H., a body corporate organised under the laws of Germany, of 732 Goeppingen, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 5 The invention relates to a notching machine for simultaneously slotting and dividing a circular blank into a stator lamination and a rotor lamination.
- 10 Notching machines of this type usually have a transport device which receives from a centring mandrel a blank to be slotted, feeds it to the actual machining station, and after slotting and division of the blank removes and stacks the rotor and stator laminations separately from one another. While the rotor laminations are automatically always in the same alignment on the completion of machining, because they include a centring slot preformed in the blank to permit it to be indexed during slotting, this automatic alignment has hitherto not been possible in the case of the stator laminations, since immediately upon separation of the stator and rotor laminations the former no longer possess any centring means. With known notching machines the stator laminations have hitherto had to be aligned by hand in an additional operation, in order to bring the slots in the separate laminations into line.
- 15 Although it is already known for the stator laminations to be releasably held on supports by electro-magnets or suction nozzles after their separation from the rotor laminations, it has been found that these measures do not provide adequate security against misalignment.
- 20 It is usual for the blanks to be provided with a so-called clamp slot in their outer peripheries, or alternatively to be provided with peripheral projections, in each case for the purpose of enabling clamping in alignment of stacks of stator laminations formed from the blanks.
- 25 According to the invention a notching machine for the simultaneous slotting and division of circular blanks into stator laminations and rotor laminations comprises locking means adapted positively to engage a notch or projection formed in the periphery of blanks to be formed into separate rotor or stator laminations upon such division whereby to secure the stator laminations against rotation.
- 30 Since they are locked by the locking means once they are separated from the blanks, the stator laminations are unable to shift circumferentially after division from the rotor laminations; subsequent stacking with their slots exactly in line is thus ensured.
- 35 Exemplary embodiments of the invention are described below with reference to the accompanying drawings, in which:—
- 40 Figure 1 shows a blank which has been partially slotted and divided in a notching machine, and which illustrates alternative features adapting it for use with different embodiments of machine in accordance with the invention;
- 45 Figure 2 shows a vertical section through a portion of a notching machine according to the invention;
- 50 Figure 3 is an enlargement of the top right-hand portion of Figure 2;
- 55 Figure 4 is a plan view of the parts shown in Figure 3, and
- 60 Figure 5 is a plan view corresponding to Figure 4, but of an alternative embodiment.
- 65 Figure 1 shows a blank 48 which has a central opening with a keyway 60 and is provided on its outer periphery with either one or more slots 61 or one or more projections 62.
- 70 The portion of a notching machine shown in Figure 2 consists of a saddle-stock shaft 28 rotatable in a stationary guide 30, and of a retractable centring mandrel 29 slidably mounted within the saddle-stock shaft. The top end of the guide 30 carries a plate

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31 with a raised edge flange 32 and a surface 44 to support stator laminations once separated from a blank carried by a support surface 43 on the head of the saddle-stock shaft 28.

By means of a transport mechanism (not shown) a blank 48 is deposited on the surface 43. During this operation a key or pin on the centring mandrel 29 engages in the keyway 60 in the blank as the mandrel is moved upwards into the central opening in the blank. Since the inner diameter of the flange 32 is only a few tenths of a millimetre larger than the outside diameter of the blank, the latter is securely located against lateral displacement relative to the shaft 28 by the flange 32 as soon as it is inserted into the punching station. The saddle-stock shaft and the centring mandrel are indexed by successive angular steps as slots 34 and dividing cuts 35 are punched in the blank by the notching machine, thus producing an inner circular rotor lamination 37 and an outer annular stator lamination 36. With progressive separation of the two laminations the portion of the blank forming the stator lamination rests on the outer support surface 44. Since the outside diameter of the inner support surface 43 is smaller than the diameter of the rotor lamination 37, the stator lamination 36 is not obstructed by the surface 43 on the upper end of the saddle-stock shaft 28 when it drops onto the support surface 44.

Figure 2 shows in its left-hand half the blank lying on the support surface 43 and in the right-hand half shows the rotor lamination 37 lying on this support surface and the stator lamination 36 lying on the outer support surface 44.

The inner face 33 of the flange 32 forms a centring surface and holds the stator lamination 36 fast against lateral displacement, particularly during the final cut 35 that separates the laminations, so that the stator lamination is centred and cannot become caught up on the rotor lamination 37.

As illustrated in Figures 2-4, a pawl 64 is mounted for movement about a pivot 63 and passes through an aperture in the plate 31. The pawl 64 can be remotely actuated, for example by means of a solenoid 65, so as to enter the slot 61 in the blank 48. Upon removal from a stack by the transport mechanism each successive blank is deposited on the inner support surface 43 on which it is aligned by the mandrel 29 so that immediately preceding, during or after commencement of the last dividing cut 35, the slot 61 lies exactly opposite the pawl 64. Up to this moment, the blank is indexed by the key on the mandrel 29 in accordance with the pitch of the successive cuts made in the blank. When the slot 61 and the pawl 64 are situated opposite one another, the

solenoid 65 is energised and the pawl engages in the slot so that the stator lamination 36 is secured against rotation relative to that plate 31. The position of the stator lamination, which is thus accurately aligned, cannot thereafter be disturbed either by movement of the rotor lamination 37, which may continue to rotate for a further half pitch, or by forces originating from the punch used to form the slots and cuts in the blank. As shown in Figures 3 and 4, the pawl 64 is adapted to engage either side of the slot 61. If undesirable rotational forces can act only in one direction on the stator lamination, it is sufficient for the pawl to be adapted to engage only that side of the slot from which the rotational forces originate. Once the stator lamination has been removed by the transport mechanism for the purpose of stacking in alignment on a mandrel, the pawl is returned to its retracted position by de-energisation of the solenoid 65.

In a modification of the embodiment of the invention illustrated in Figures 2-4, the blank 48' shown in Figure 5 is provided with a beak-like projection 62 instead of the slot 61 (see also Figure 1, left-hand side). In order to secure in position a blank which is provided with an external periphery interrupted in this manner, the pawl is replaced by a fork-shaped latch 66 which is mounted for movement about a pivot 63' and operated by a solenoid 65' so that immediately preceding, during or after commencement of the last dividing cut 35 it engages both sides of the projection 62. The mode of operation of this latch is the same as that of the pawl 64, and similarly, when rotational forces set on the stator lamination 36 from one direction only, the latch 66 need only be adapted to lie against that side of the projection 62 from which the forces originate.

WHAT WE CLAIM IS:—

1. A notching machine for the simultaneous slotting and division of circular blanks into stator laminations and rotor laminations, wherein locking means are provided adapted positively to engage a notch or projection formed on the periphery of blanks to be formed into separate rotor and stator laminations upon such division, whereby to secure the stator laminations against rotation.
2. A notching machine according to claim 1 wherein the locking means is a pawl arranged to engage either or both sides of a notch in the outer periphery of a blank being machined.
3. A notching machine according to claim 1 wherein the locking means is a latch arranged to engage either or both sides of a projection on the outer periphery of a blank being machined.

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4. A notching machine according to any of the preceding claims wherein the locking means is remotely controlled.

5. A notching machine according to any of the preceding claims wherein the operation of the locking means is synchronised with that of the machine so that the locking means is actuated to secure each stator lamination as it is divided from its blank.

10 6. A notching machine according to

claim 1, substantially as hereinbefore described with reference to the accompanying drawings.

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Fig. 1

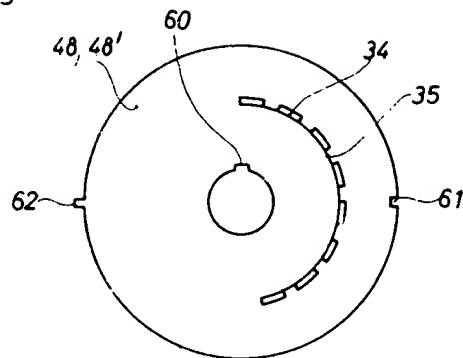
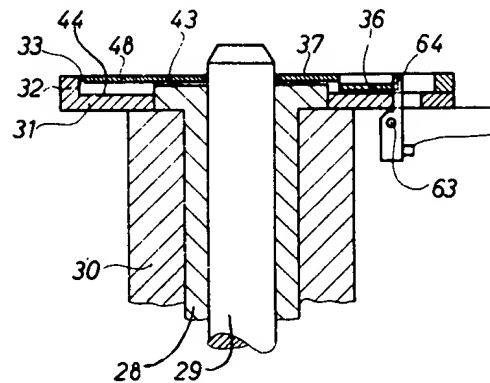


Fig. 2



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COMPLETE SPECIFICATION

2 SHEETS

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the Original on a reduced scale
Sheet 2

Fig. 3

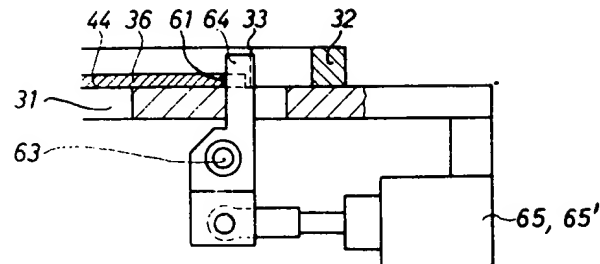


Fig. 4

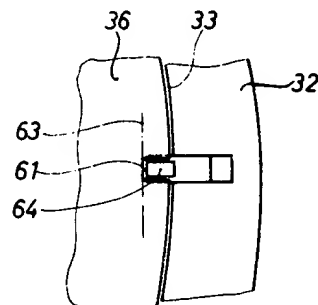


Fig. 5

